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Rocky Mountain Research Station

Science You Can Use *(in 5 minutes)*

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Restoration Catch-22: Overcoming Issues With Seed Predation by Small Mammals When Trying to Restore Habitat

We assume animal populations rebound when we restore their habitat by using native plants. But what happens when you are trying to restore native plant habitat for small mammal communities, and these same mammals are eating the seeds of the plants you are trying to reintroduce? Recently published work by Rocky Mountain Research Station scientists Dean Pearson and Yvette Ortega and collaborators addresses this "restoration Catch-22" by looking at how active plant restoration fosters small mammal communities, and how these mammals can be prevented from eating the seeds of the native plants during the restoration process.

Seed predation by deer mice impedes native plant establishment

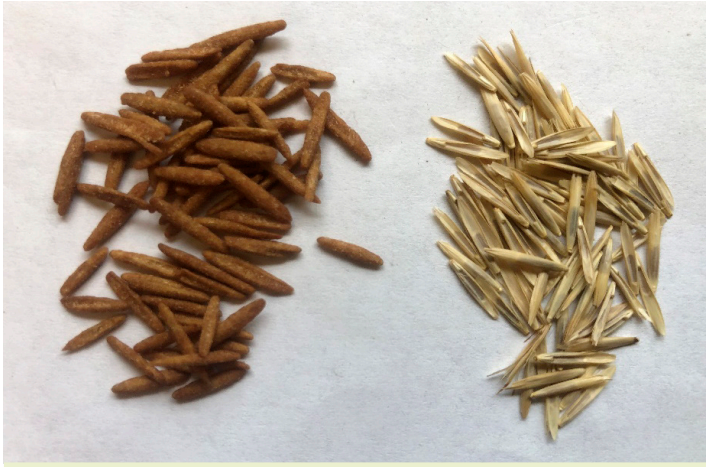
Working in grasslands in western Montana, the researchers found that actively restoring native grassland communities in areas once dominated by introduced forage grasses does lead to the return of small mammal communities. "However," Pearson says, "we also found that seed predation by these same small mammals can interfere with early restoration seeding efforts, as they are voracious eaters of key native plant seeds." Through seed predation, small mammals such as deer mice greatly reduce establishment of new plants and slow the recovery of targeted native plants. According to Ortega, "Efforts to restore native plants by sowing seed is likely to be impeded by small mammals, even in years when conditions are otherwise favorable for plant establishment."

The deer mouse is a common seed predator in grasslands targeted for restoration and the most widespread seed predator in North America. Photo by Milo Burcham .

Coating native plant seeds can reduce seed predation

Luckily, some of Pearson and Ortega's prior work on seed predation offers a possible solution to this problem. Using the infamously hot ghost pepper—aka Bhut Jolokia—they created a seed coating that deer mice in a lab avoided compared to uncoated seeds. After 4 years of field trials, along with improvements in coating techniques and sowing the seeds later in the winter, the scientists were able to successfully negate seed predation in restoration projects. This gave native plants a window to become established.

Looking at an even wider suite of seed coatings in a subsequent study, they found that chili powder, neem oil, and activated carbon all served as deterrents to seed predation by small mammals. And, explains Pearson, "The increase in seedling recruitment is sufficient to offset the additional costs of seed coating, making this a value-added technique for improving restoration." Moreover, other research suggests that some coatings may also protect against microbial attack and herbicide resistance. Pearson and Ortega offer the caution that any new seed-coatings should be screened for negative effects on germination.



Coating seeds with substances such as chili pepper can reduce seed predation by small mammals in restoration projects, as seen here where bluebunch wheatgrass seeds are coated with ghost pepper (left) and remain uncoated (right). USDA Forest Service photo by Dean Pearson.

KEY MANAGEMENT CONSIDERATIONS

- Restoration efforts can be negatively impacted by increases in small mammals. These small mammals consume larger seeds of the native plant community, hampering the establishment of new plants and the recovery of existing plants.
- An approach to overcome this problem is to coat seeds being used for restoration projects with seed predation deterrents. RMRS researchers have identified substances successful in deterring seed predation, including chili powder, neem oil, and activated carbon.
- In this study, the increased seed recruitment success was enough to offset the cost of coating the seeds.

FURTHER READING

Pearson, Dean E.; Ortega, Yvette K.; Cimino, Hillary E.; Mummy, Daniel L.; Ramsey, Philip W. 2021. Does active plant restoration passively restore native fauna community structure and function? Restoration Ecology. doi:10.1111/rec.13481.

Taylor, Justin B.; Cass, Kristina L.; Armond, David N.; Madsen, Matthew D.; Pearson, Dean E.; St. Clair, Samuel B. 2020. Deterring rodent seed-predation using seed-coating technologies. Restoration Ecology. 28(4): 927-936. doi: 10.1111/rec.13158.

Pearson, Dean E.; Valliant, Morgan; Carlson, Chris; Thelen, Giles C.; Ortega, Yvette K.; Orrock, John L.; Madsen, Matthew D. 2019. Spicing up restoration: Can chili peppers improve restoration seeding by reducing seed predation? Restoration Ecology. 27(2): 254–260. doi: 10.1111/rec.12862.

PROJECT LEADS

Dean Pearson is a research ecologist at RMRS in Missoula, Montana. His current research focus is applying community ecology to address the problem of biological invasions (introduced pest species).

Yvette Ortega is an ecologist at RMRS in Missoula, Montana. Her primary interest is in building understandings of ecological patterns and processes to improve the management of natural systems.

The Rocky Mountain Research Station is one of seven units within USDA Forest Service Research & Development. RMRS maintains 14 field laboratories throughout a 12-state geography encompassing parts of the Great Basin, Southwest, Rocky Mountains, and the Great Plains. While anchored in the geography of the West, our research is global in scale. RMRS also administers and conducts research on 14 experimental forests, ranges and watersheds and maintains long-term research databases for these areas. Our science improves lives and landscapes. More information about Forest Service research in the Rocky Mountain Region can be found here: https://www.fs.usda.gov/rmrs/.